Graphene Oxide and Reduced Graphene Oxide Microwire Arrays Fabricated by Convective Self-Assembly

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Graphene and its derivatives, with their excellent optical, electrical and mechanical properties, have been researched with a view to optoelectronics and sensing applications [1]. Low defects CVD deposited graphene substrates for sensing are high-cost, difficult to control and require a transfer phase [2]. By contrast, graphene oxide and its reduced form have the advantage of liquid phase processing and large scale production at low costs. Previously, GO/rGO films or patterened substrates have been fabricated by spin or drop casting, vacuum-filtration procedures and even ink-jet printing [3,4].

We report the production of transparent GO and rGO arrayed microwires (stripe-like) on glass and on flexible substrates made of polyethylene terephthalate (PET), by convective self-assembly (CSA) of GO and rGO aqueous solutions obtained via a Hummers modified method. The reduction was made chemically, with hydrazine hydrate assisted by microwave radiation. CSA was generally utilized to produce large area, uniform or patterned films of nanoparticles and microparticles [5]. In this work we explore the possibilities of this technique in the deposition of GO and rGO solutions.

By adjusting several experimental parameters, in the Stop&Go CSA variant [6], the width/heigth of the stripe and the stripe inter-distance could be controlled independently. Furthermore, optical microscopy, AFM, Raman imaging and transmission optical spectroscopy measurements are performed to characterize the GO and rGO stripes properties. Figure 1 shows a representative optical microscopy image of GO strips on a glass substrate.

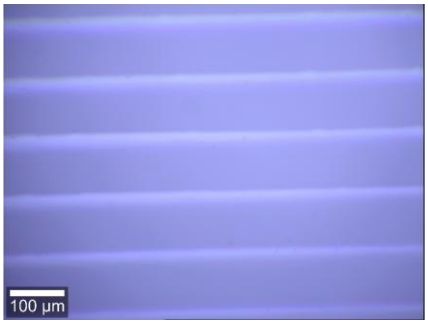

Figure 1: Optical microscopy image of GO stripes on glass.

References

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The electrical properties of the as obtained microwire arrays are currently under investigation. The rGO stripes are expected to have an enhanced electrical conductive behavior compared to their oxide stripes counterparts due to the "self-healing" of the structure following the reduction procedure, meaning the C- sp^2 domains are partially restored. The GO and rGO arrayed microwires obtained in this work show great potential for developing electrodes in the area of transparent and flexible electronics, and even sensing applications [7].